

MODIS SCIENCE TEAM MEMBER
Quarterly Report (July - Sept 1994)

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a) Task Objectives

The objectives of this phase of the project were: to continue the research program developing the 'at-launch' algorithms for MODIS atmospheric correction, vegetation indices, fire detection and land cover and to build the infrastructure and collaboration to permit the research to be undertaken. The project has developed a number of collaborative projects which are intended to expand the scope of the team members activities and involve a larger community in the MODIS research. Due to the small number of researchers addressing the issues necessary for the methodological advances needed for MODIS, emphasis has been given to developing international collaborative research and MODIS outreach through the IGBP Data and Information System Core Project. In addition, the goals of the MODIS project, the status of the instrument and preliminary results of the research were presented at key scientific meetings. The project was also represented at the MODIS Team meeting. Results of the studies undertaken as part of the project are in the process of being written up and submitted for publication.

b) Tasks Accomplished (Data analysis and interpretation)

Specifically the project has addressed the following topics over the last six months:

MODIS atmospheric correction:

- The 6S code: Version 3.2 is in preparation. Version 3.2 will remedy the bugs discovered in Version 3.1 as well as final improvements. A paper on 6S is currently in preparation with D. Tanre which will describe the Code and give the accuracy of the various simulations. Collaboration with the BRDF group (Alan Strahler) has been initiated to solve the circularity problem in atmospheric correction/ BRDF products. The approach selected will be tested on BRDF's fitted from

Kimes (Code 923) measurement data set which are used as lower boundary conditions in simulations performed with the 6S code.

- Stratospheric aerosols:

An inversion scheme for stratospheric aerosols has been applied to NOAA7-9-11 data. Monthly stratospheric aerosol optical depth profiles produced from the El Chichon eruption inverted from AVHRR/NOAA7 data have been compared to SAGE data and very good agreement (+0.02-0.05 od units) has been found.

MODIS Airborne Simulator:

- A paper was presented on the atmospheric correction scheme applied to MAS data using the SCAR-A dataset. Retrievals of aerosol optical depth using the middle infrared channel, initially done at 0.670 micron, have been performed at 0.550 microns to test the characterization of aerosol type. In both cases, comparisons with sunphotometer measurements are good (+- 0.03 RMS). These results allow us to perform spectral BRDF studies (which are under analysis).

Sunphotometer Network Atmospheric Correction Validation:

-The proposal to NASA on LTER Atmospheric Correction received mixed reviews from excellent to poor. It is pending a programmatic decision with respect to funding. This proposal was intended to augment the MODIS pre-launch R&D activity exercising the operational atmospheric correction method on AVHRR and TM data using LTER located sun-photometer data as the validation. It is linked to the MODIS test site concept and a proposal using the corrected data for FPAR analysis is being written by Running and al.

- Prototyping with AVHRR and Sunphotometer data. Brazil sunphotometer network measurements (Holben 923) have been compared to automated retrievals using AVHRR data. The analysis of 3 months of results shows a very good agreement (better than 10%) between sunphotometer measurements and retrieved optical depths using the AVHRR-ch3 reflectance threshold method to identify dark pixels in channel 1.

MODIS Land Cover:

- Dr Justice attended the IGBP-DIS Validation Working Group Meeting on Land Cover in Cambridge UK. Initial discussions were held

concerning the modification of the IGBP Land Cover product as the at-launch stratification of land cover to be used by MODIS.

- Discussions were held with Dr K. McGwire and EDC DAAC staff concerning the 1994-1995 Landsat Pathfinder GLCTS initiative.

MODIS Fire Detection:

- Luke Flynn (Univ. of Hawaii) was contracted to help in the Fire Algorithm development work. He participated in the SCAR C experiment and provided NASA Ames (MAS) with a calibration of their hotplate and light sources. These components are critical to obtaining useful MAS calibrations for the SCAR-C data. He has initiated a study to produce a MODIS prototype data set using a the Yellowstone Fire TM image (Sept. 8, 1988: when 1 million acres of the park was either burning or was a burn scar). He created the 1.5, 2.1, and 11 micron data sets, and is working on suitable assumptions for producing the 3.9 micron data set. He is currently working on the feasibility of discriminating between smoldering and flaming conditions using TM data.

- Work continued on the AVHRR fire algorithm - a comparison data set is being designed using DMSP and GOES data to examine the diurnal sampling aspects of MODIS data.

MODIS Vegetation Index:

- Examination of the atmospheric correction currently implemented as part of the AVHRR pathfinder processing used as an input to the VI product has revealed some bugs. Dr Vermote is currently working with the Pathfinder Staff to examine the implications.

- The MNDVI is being evaluated for a number of TM data sets currently held in house.

c) Data / Analysis / Interpretation

- Continued analyses of AVHRR, MAS and Landsat TM data were performed as part of the MODLAND prototyping effort.

- Work was started to develop the Beta Delivery Code and test data sets planned for delivery in early November. The Code will be based on the MAS data for testing and will include the Code to derive vegetation indices.

Meetings Attended

- ElSaleous and Vermote attended the Flathead meeting on Test data sets in September.
- Justice attended the EDC DAAC SWG in September.
- Justice attended the IGBP-DIS Land Cover Validation Working Group meeting in Cambridge in September.
- Vermote attended the Carbonaceous Aerosol Workshop in California in August

d) Anticipated Future Actions.

Research:

Code Delivery
AVHRR Global Fire Analyses
MAS development work

Upcoming Meetings:

Biomass Burning Interagency Strategy Meeting (Dec)
POLDER First Science Meeting (Dec)

Hardware Purchase

e) Problems/Corrective Actions

Nothing to report

f) New Papers

Vermote, E. F., ElSaleous, N. Z., Kaufman, Y. J. and Dutton, E.,
Stratospheric aerosol perturbing effect on the remote sensing of
vegetation: Correction method for the composite NDVI after the
Pinatubo eruption. (Submitted in March to special issue of RSE).

Roger, J. C. and Vermote, E. F., Computation and use of the
reflectivity at 3.75mm from AVHRR channels. (Submitted in March
to special issue of RSE).

Vermote, E.F., and Kaufman, Y.J., Absolute calibration of AVHRR
visible and near infrared channels using ocean and cloud views.
(Submitted in Feb to Int. J. Rem. Sens).

Justice, C.O., Kendall, J., Dowty, P., and Scholes, R. J., Satellite remote sensing of fires during the SAFARI Campaign using NOAA AVHRR data. (Submitted to JGR)

Scholes, R.J., Ward, D., and Justice, C.O., Emissions of trace gases and aerosol particles due to vegetation burning in Southern Africa. (Submitted to JGR)

Huete, A., Justice, C.O., and Liu, H., Development of Vegetation and Soil Indices for MODIS. R. S. Env 49: 224-234.